CLAIMS

We Claim:

1. A vane for use in a variable geometry exhaust gas driven turbocharger, comprising:

a vane body (34) adapted for pivoting around a pivot axis, said vane body (34) having

first and second planar surfaces (80,82) perpendicular to said pivot axis on respective axial ends;

a vane bore (38) in said first planar surface (80) adapted for receiving a vane post (28) therein perpendicular to said first planar surface (80); and

a single actuation post extending perpendicularly from said first planar surface (80).

2. The vane as recited in claim 1, wherein when the vane body (34) is viewed axially, a first pressure surface (84) and a second pressure surface (86) together define a footprint of the vane body (34), wherein said single actuation post is located outside of the footprint and wherein said single actuation post may be attached to a vane extension (98) and said vane extension (98) is attached to said vane body (34).

3. A variable turbocharger geometry assembly comprising:

a turbine housing (18) with at least one supply channel in said turbine housing (18) for supplying exhaust gas;

at least one turbine wheel (12) rotatably supported on a shaft (16) within said turbine housing (18), said at least one supply channel being arranged to supply said exhaust gas to said at least one turbine wheel (12);

a plurality of static pivot points arranged as a ring of elements (24) ;

a ring of actuation elements (48) coaxial with said plurality of static pivot points arranged as a ring of elements (24);

an array of vanes (34) adjacent to at least one of said plurality of static pivot points arranged as a ring of elements (24) and said ring of actuation elements (48);

vane posts (28) extending between said plurality of static pivot points arranged as a ring of elements (24) and said array of vanes (34); and

actuation posts (36) extending between said ring of actuation elements (48) and said array of vanes (34) wherein a pivoting movement of the rings (24, 48), relative to the other, causes pivoting movement of said array of vanes (34).

4. The variable geometry turbocharger of claim 3, wherein said plurality of static pivot points arranged as a ring of elements (24) is a static ring having a static ring first surface (26), said ring of actuation elements (48) is an actuator ring having an actuator ring first surface (50), and said static ring first surface (26) is co-planar with said actuator ring first surface (50) and at least one of said static ring or said actuator ring has slots.

5. The variable geometry turbocharger of claim 4, wherein the static ring is affixed to a flange (25), wherein the flange (25) may be a part of the turbine housing (18).

6. The variable geometry turbocharger of claim 5 wherein said static ring or said actuator ring is pivoted by a rotary electric actuator (27).

7. A variable geometry turbocharger assembly comprising:

a plurality of vane posts (28);

a plurality of vanes (34), wherein each of said plurality of vanes (34)

is adapted for pivoting and has first and second planar surfaces (80,82) perpendicular to a pivot axis on respective axial ends of each of said plurality of vanes (34);

has a vane bore (38) in said first planar surface (80) for receiving a respective vane post (28) therein perpendicular to said first surface (80); and

has a single actuation post (36) extending perpendicularly from said first surface (80); and

means for pivoting the plurality of vanes.

8. The turbocharger of claim 7, further comprising: a turbine housing (18) and a turbine housing insert ring (94) positioned between the plurality of vanes (34) and said turbine housing (18).

9. The turbocharger of claim 7 wherein the means for pivoting the plurality of vanes comprises:

an actuator ring having a actuator ring first surface (50) parallel to and adjacent to said vane first planar surface (80) and having a plurality of slots (52) therein perpendicular to said actuator ring first surface (50) for receiving sliding blocks (54), wherein each said sliding block (54) has a respective sliding block hole (60), wherein each said sliding block hole (60) receives

a respective said actuation post (36) from a respective said vane (34) and wherein each respective said sliding block (54) is slidably received by a respective said slot (52), wherein rotation of said actuator ring causes each respective said sliding block (54) to slide within a respective said slot (52), thereby moving each said actuation post (36), thus pivoting each said vane (34) radially relative to the respective said pivot axis.

10. The turbocharger of claim 7, wherein the means for pivoting the plurality of vanes comprises:

an actuator ring having an actuator ring first surface (50) parallel to and adjacent to each of said vane first planar surface (80) and having a plurality of slots (52) therein perpendicular to said actuator ring first surface (50) for receiving said actuation posts (36) from said vanes (34), wherein rotation of said actuator ring causes each actuation post (36) to slide within its respective said slot (52), moving each vane (34) radially relative to the respective said pivot axis.

11. The turbocharger of claim 10, further comprising:

a static ring having a static ring first surface (26) coplanar to said actuator ring first surface (50), said static ring having a plurality of static ring bores (30) perpendicular to said static ring first surface (26) for receiving said vane posts (28).

12. The turbocharger of claim 10, further comprising:

a static ring having a static ring first surface (26) coplanar to said actuator ring first surface (50),

said static ring having a plurality of static ring bores (30) perpendicular to said static ring first surface (26) for receiving said vane posts (28).

13. The turbocharger of claim 12, wherein said vane posts (28) are pivotably received in said static ring bores (30) and pivotably received in said vane bores (38).

14. The turbocharger of claim 12, wherein said vane posts (28) are fixedly received in said static ring bores (30) and pivotably received in said vane bores (38).

15. The turbocharger of claim 12, wherein said vane posts (28) are pivotably received in said static ring bores (30) and fixedly received in said vane bores (38).

16. The turbocharger of claim 12, wherein said vane posts (28) are press fit in said static ring bores (30) and pivotably received in said vane bores (38).

17. The turbocharger of claim 8, wherein said static ring and said actuator ring are concentric and positioned axially adjacent to the vanes (34).

18. The turbocharger of claim 16, wherein said vane posts (28) are pivotably received in said static ring bores (30) and pivotably received in said vane bores (38).

19. The turbocharger of claim 16, wherein said vane posts (28) are fixedly received in said static ring bores (30) and pivotably received in said vane bores (38).

20. The turbocharger of claim 16, wherein said vane posts (28) are pivotably received in said static ring bores (30) and fixedly received in said vane bores (38).

21. The turbocharger of claim 16, wherein said vane posts (28) are press fit in said static ring bores (30) and pivotably received in said vane bores (38).

22. The turbocharger of claim 21, wherein said static ring or said actuator ring is pivoted by a rotary electric actuator (27).